

# LONDON- WEST MIDLANDS ENVIRONMENTAL STATEMENT

## Volume 5 | Technical Appendices

CFA24 | Birmingham Interchange and Chelmsley Wood  
**Operational assessment (SV-004-024)**  
Sound, noise and vibration

November 2013

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## Department for Transport

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## Appendix SV-004-024

Environmental topic:	Sound, noise and vibration	SV
Appendix name:	Operation assessment	004
Community forum area:	Birmingham Interchange and Chelmsley Wood	024

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# 1 Introduction

## 1.1 Structure of the sound, noise and vibration appendices

- 1.1.1 The sound, noise and vibration appendices comprise four sections. The first of these details the methodology used (Appendix SV-001-000) and relates to the sound, noise and vibration assessment for all community forum areas (CFA).
- 1.1.2 For the Birmingham Interchange and Chelmsley Wood community forum area (CFA24), the other three sections are as follows:
- baseline sound, noise and vibration (Appendix SV-002-024);
  - construction sound, noise and vibration (Appendix SV-003-024); and
  - operational sound, noise and vibration (Appendix SV-004-024) (this appendix).
- 1.1.3 The outcomes of this assessment are summarised in Volume 2: CFA24 Report, Chapter 11 Sound, Noise and Vibration.
- 1.1.4 Maps referred to throughout the sound, noise and vibration appendices are contained in the Volume 5 sound, noise and vibration map book.
- 1.1.5 This appendix presents the likely noise and vibration impacts, effects and significant effects arising from the operation of the Proposed Scheme for the Birmingham Interchange and Chelmsley Wood area on:
- people, primarily where they live ('residential receptors') in terms a) individual dwellings and b) on a wider community basis, including any shared community spaces; and
  - community facilities such as schools, hospitals, places of worship, and also commercial properties such as offices and hotels, collectively described as 'non-residential receptors' and 'quiet areas'.
- 1.1.6 The assessment of likely impacts, effects and significant effects from operational noise and vibration on agricultural, community, ecological or heritage receptors and the assessment of tranquillity are presented in the following documents within Volume 5:
- Agriculture, forestry and soils      Appendix AG-001-024
  - Community                                  Appendix CM-001-024
  - Ecology                                        Appendix EC-005-004
  - Heritage                                        Appendix CH-003-024
  - Landscape and Visual                  Appendix LV-001-024

## 1.2 Evaluation of impacts and effects

- 1.2.1 This appendix provides a quantitative assessment of operational noise and vibration impacts and effects and a qualitative assessment of likely significant effects, based on the impacts and effects identified and other local context information consistent with the scope and methodology defined for the Proposed Scheme.

- 1.2.2 Indirect effects arising from permanent changes in traffic patterns on the existing road and rail networks as a consequence of the Proposed Scheme are also reported in this appendix, where they would occur within the study area as defined in Volume 5 Appendix SV-001-000.
- 1.2.3 Route-wide impacts, effects and significant effects associated with noise or vibration from the operation of the Proposed Scheme are reported in Volume 3.
- 1.2.4 Off-route effects of noise or vibration arising from the operation of the Proposed Scheme, including those likely to arise from permanent changes in traffic patterns on roads or railways outside of the study area for direct effects are reported in Volume 4.
- 1.2.5 In undertaking the assessment of sound, noise and vibration, consistent with EIA Regulations and emerging National Planning Practice Guidance<sup>1</sup> a differentiation between impacts effects, adverse effects and significant effects is made. Further information is provided in Volume 5: Appendix SV001-000.
- 1.2.6 The assessment of impacts has been undertaken at assessment locations that are representative of a number of dwellings or other sensitive receptors. The Assessment Locations employed in this assessment are presented on map series Sv-02 in the CFA24 Volume 5 sound, noise and vibration map book.

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<sup>1</sup> National Planning Practice Guidance – Noise <http://planningguidance.planningportal.gov.uk> ; refer to the table summarising noise exposure hierarchy

## 2 Scope, assumptions and limitations

### 2.1 Regional and local policy guidance

2.1.1 The policy framework for sound, noise and vibration is set out in Volume 1 and in Appendix SV-001-000. As part of the engagement with local authorities through the Planning Forum Sub Group (Acoustics), information regarding any specific local planning guidance in respect of noise and vibration has been requested. Whilst no information has been received for this study area via the Planning Forum Sub Group - Acoustics, the following local policy guidance on noise and vibration has been identified:

- The Solihull Unitary Development Plan - Feb 2006;
- Solihull Draft Local Plan - Sept 2012; and
- The North Warwickshire Local Plan - July 2006

2.1.2 This guidance has been considered as part of formulating the detailed application of the impact and significance criteria set out in Volume 5: Appendix SV-001-000.

### 2.2 Engagement

2.2.1 Details of engagement on a route-wide basis with the local and county authorities' Environmental Health Practitioners via the Planning Forum Sub Group - Acoustics, is set out in Volume 1, Section 8.

2.2.2 Engagement with communities has been via the Community Forums, as set out in Volume 1. In respect of sound, noise and vibration the following discussions have taken place:

- general discussions in respect of local issues, including possible ways to avoid and mitigate the potential impacts of noise or vibration
- September / October 2012; a specific presentation about sound, noise and vibration with discussion afterwards with one of the project team specialists;
- November / December 2012; specific request for the Community Forum to propose baseline sound monitoring locations;
- January / February 2013; feedback to the Community Forum on any proposed baseline monitoring locations; and
- verbal / written response to questions on sound, noise and vibration.

### 2.3 Methodology

2.3.1 The methodology used for the assessment of airborne sound, ground-borne sound and vibration impacts and the determination of significant effects is defined in the Scope and Methodology Report (SMR) (Volume 5: Appendix CT-001-000/1), is clarified in a number of areas by the SMR addendum (Volume 5: Appendix CT-001-000/2). Further information is contained in Volume 5: Appendix SV-001-000.

## **2.4 Assumptions**

- 2.4.1 Route-wide assumptions are outlined in Volume 1, Section 8, and are further detailed in Volume 5: Appendix SV-001-000. Local assumptions that apply to the assessment of operational sound noise and vibration within this CFA are set out in Volume 2: Report 24.

## **2.5 Local limitations**

- 2.5.1 In this area, there are a number of locations where the land or property owners did not permit baseline sound level monitoring to be undertaken at their premises. However, sufficient information has been obtained to undertake the assessment. Further information is provided in Volume 5: Appendix SV-002-024.

## 3 Environmental baseline

### 3.1 Existing baseline

- 3.1.1 Baseline sound level data has been collected at locations representative of the airborne sound-sensitive receptors. The existing and future baseline airborne sound levels derived from these measurements are included within Table 3. Details of the baseline data collection and the methodology are given in Volume 5: Appendix SV-001-000 and specifically for this study area in Volume 5: Appendix SV-002-024.
- 3.1.2 The majority of receptors adjacent to the line of the route are not currently subject to appreciable vibration and therefore vibration at all receptors has been assessed using the absolute vibration criteria as described in Volume 5: Appendix SV-001-000.

### 3.2 Future baseline

- 3.2.1 The assessment is based upon the predicted change in sound levels that result from the Proposed Scheme. The assessment initially considered a reasonable worst case (that would overestimate the change in levels) by assuming that sound levels would not change from the existing baseline year of 2012/2013. Where significant effects were identified on this basis, the effects have been assessed using the baseline year of 2026 to coincide with the proposed start of passenger services. The future baseline is for the sound environment that would exist in 2026 without the Proposed Scheme.

## 4 Effects arising during operation

### 4.1 Introduction

4.1.1 The assessment is reported first for ground-borne sound and vibration and then for airborne sound. Under each of these headings, the results of the quantitative identification of impacts and effects are presented. This is followed by the identification of significant effects and the evidence used to support these conclusions.

4.1.2 The structure of this assessment report is:

- Avoidance and mitigation measures
- Quantitative identification of impact and effects
  - Ground-borne sound and vibration
    - Residential
    - Non-residential
  - Airborne sound
    - Residential
    - Non-residential
- Assessment of impacts and effects
  - Residential receptors: direct effects – dwellings
  - Residential receptors: direct effects – communities
  - Residential receptors: indirect effects
  - Non-residential receptors: direct effects
  - Non-residential receptors: indirect effects
  - Cumulative effects from the proposed scheme and other committed development.

### 4.2 Avoidance and mitigation measures

4.2.1 These are set out in Volume 2: Report 24.

### 4.3 Quantitative identification of impacts and effects

#### Ground-borne sound and vibration

4.3.1 Assessment locations defined for the quantitative assessment of impacts are shown on map series SV-02 in the CFA24 Volume 5 sound, noise and vibration map book.

4.3.2 For each Assessment Location, the assessment results for residential and non-residential receptors are presented in Table 1. Explanation of the information in Table 1 is provided in Appendix SV-001-000, with the following additional notes.






B	For non-residential receptors further detail about the type of effect is set out in the text of Volume 5: Appendix SV-001-000.
NA	Type of effect - Generally no adverse effect
A	Type of effect - Adverse effect
S	Type of effect - Significant adverse effect
VDV	Vibration Dose Value
~	The forecast adverse effects are not considered to be significant on a community basis (further information on methodology is provided in Volume 5: Appendix SV-001-000).
^	The impact methodology has identified a potential significant effect at this receptor which based upon further qualitative information is not considered to be a likely significant effect. Please refer the end of this Appendix for further information.
	Where the significant effect column is highlighted in pink, then a significant effect is identified at the referenced residential community area, or individual receptor.
	Yellow denotes a low ground-borne noise impact or a minor ground-borne vibration impact
	Orange denotes a medium ground-borne noise impact or a moderate ground-borne vibration impact
	Red denotes a high ground-borne noise impact or a major ground-borne vibration impact
	Dark red denotes a very high ground-borne noise impact

Table 1: Ground-borne sound and vibration levels, noise and vibration impacts and effects

Assessment location		Impact criteria				Significance criteria								Significant effect
		Ground-borne sound level dB L <sub>pASmax</sub>	VDV m/s <sup>1.75</sup> Daytime (07:00 - 23:00)	VDV m/s <sup>1.75</sup> Night time (23:00 – 07:00)	% increase or decrease in VDV	Number of impacts represented	Type of effect	Type of receptor	Receptor design	Existing environment	Unique feature	Combined impact	Mitigation effect	
ID	Area represented													
181503	Chester Road, Coleshill	-	0.27	0.13	-	1	A	R	T	-	-	-	-	~

## Impact summary

- 4.3.3 The operational ground-borne noise and vibration impacts identified in Table 1 are summarised in Table 2.

Table 2: Summary of operational ground-borne noise and vibration impacts

	Number of ground-borne sound impacts			
	Low	Medium	High	Very High
Residential properties	0	0	0	0
Non-residential properties	0			0
	Number of ground-borne vibration impacts			
	Minor	Moderate	Major	Risk of building damage
Residential properties	1	0	0	0
Non-residential properties	0			0

## Airborne sound: direct impacts and effects

- 4.3.4 The direct effects from the operation of the Proposed Scheme as well as any new, amended or altered roads or railway lines, which are identified as part of the scheme, are presented in Table 3.
- 4.3.5 The assessment information, impact criteria and significance criteria for the assessment of the incorporated mitigation case at residential and non-residential receptors are presented in Table 3. The results should be considered in conjunction with the information contained in map series Sv-02 in the CFA24 Volume 5 sound, noise and vibration map book.
- 4.3.6 Explanation of the Table 3 information is provided in Volume 5: Appendix SV001-000, with the following additional notes.



Where the significant effect column is marked, then a significant effect is identified at the referenced group of dwellings, or individual residential or non-residential receptor.

Yellow denotes a minor impact at a residential building – a change is of 3-5 dB

Orange denotes a moderate impact at a residential building – a change is of 5-10 dB

Red denotes a major impact at a residential building – a change is of >10 dB

\* Day -  $L_{pAeq,07:00-23:00}$

\*\* Night -  $L_{pAeq,23:00-07:00}$

\*\*\* Max -  $L_{pAFmax}$  In the Proposed Scheme only column, two values are presented. The first is the value for the HS2 mitigated train and the second is the value for the TSI compliant train. For further information refer to Volume 5: Appendix SV-001-000.

\*\*\*\* Where the Proposed Scheme modifies an existing source, i.e. road or railway realignments, the *Proposed Scheme only* level in the table includes the sound from the modified source. In this situation the *Do something (Opening year baseline + Year 15 traffic)* level has been corrected so as to not double count the sound associated with the road or railway on its new and existing alignment.

A Adverse effect

B For non-residential receptors further detail about the type of effect is set out in the text of Appendix SV-001-000.

CD Committed Development. The value in brackets in the number of impacts represented column is

the value with the committed development.

G	(G1)Theatres, large auditoria and concert halls, (G2) Sound recording and broadcast studios, (G3) Places of meeting for religious worship, courts, cinemas, lecture theatres, museums and small auditoria or halls, (G4) Schools, colleges, hospitals, hotels and libraries, and (G5) Offices and general commercial premises
H	High existing ambient sound level. Defined as $>65\text{dB}_{\text{L}_{\text{Aeq, day}}}$ and/or $>55\text{dB}_{\text{L}_{\text{Aeq, night}}}$
L	Low existing ambient sound level. Defined as $<42\text{dB}_{\text{L}_{\text{Aeq, day}}}$ and/or $<32\text{dB}_{\text{L}_{\text{Aeq, night}}}$
LD	Landscape receptor
NA	Generally no adverse effect
NI	The receptor is predicted to qualify for mitigation, which shall be provided to the specification defined in the Noise Insulation (Railways and other Guided Rail Systems) Regulations 1996
R	Residential
RM	Residential mooring
S	Significant adverse effect
U	Unacceptable adverse effect
#	A change of 3dB or greater has been identified however, the assessment methodology only defines an impact where the absolute sound level from the Proposed Scheme is greater or equal to 50 dB $L_{\text{pAeq, 23:00} - 07:00}$ during the daytime or 40 dB $L_{\text{pAeq, 07:00} - 23:00}$ at night. At the receptor denoted the absolute level condition is not met and therefore no impact is identified.
~	The forecast adverse effects are not considered to be significant on a community basis (further information on methodology is provided in Volume 5: Appendix SV-001-000)..
\$	A change of 3dB or greater has been identified however, the impact methodology for non-residential receptors includes a screening criteria for G3 building use of 50 dB $L_{\text{pAeq, 07:00-23:00}}$ , for G4 building use 55 dB $L_{\text{pAeq, 07:00-23:00}}$ and 45 dB $L_{\text{pAeq, 23:00-07:00}}$ , for G5 building use 55 dB $L_{\text{pAeq, 07:00-23:00}}$ . At the receptor denoted the screening criteria is not met and therefore no impact is identified. Further information is provided in Volume 5: Appendix SV-001-000.
^	The impact methodology has either identified an impact at a receptor which based upon further qualitative information does not gives rise to a significant effect. Further information is provided at the end of this Appendix.

Table 3: Operational airborne sound level, noise impacts and effects

Assessment Location		Impact criteria										Significance criteria								Significant effect
ID	Area represented	Proposed Scheme only (Year 15 traffic)			Do nothing (Opening year baseline)			Do something (Opening year baseline + Year 15 traffic) ****		Change		Type of effect	Number of impacts represented	Type of receptor	Receptor design	Existing environment	Unique feature	Combined impact	Mitigation of effect	
		Day *	Night **	Max ***	Day *	Night **	Max ***	Day *	Night **	Day *	Night **									
101140	Drake Croft, Chelmsley Wood	49	40	69/72	60	58	65	61	58	0	0	A	36	R	T	H	-	-	-	
101595	Henbury Drive, Chelmsley Wood	44	35	59/62	57	50	66	57	50	0	0	NA	47	R	T	-	-	-	-	
101701	Hawksworth Crescent, Chelmsley Wood	46	37	62/65	57	50	66	57	50	0	0	NA	42	R	T	-	-	-	-	
102534	Dunster Road, Birmingham	48	39	67/70	61	55	72	62	55	0	0	NA	29	R	T	H	-	-	-	
112149	Whitebeam Road, Birmingham	45	37	59/62	53	46	60	54	46	0	0	NA	274	R	T	-	-	-	-	
112266	Coleshill Heath Road, Birmingham	45	37	60/62	62	52	71	62	52	0	0	NA	57	R	T	-	-	-	-	
112491	Coleshill Heath Road, Birmingham	46	38	59/62	50	49	55	51	49	1	0	NA	1	R	T	-	-	-	-	
112652	Coleshill Heath Road, Birmingham	45	37	58/61	62	52	71	62	52	0	0	NA	44	R	T	-	-	-	-	
114604	Woodlands Way, Birmingham	47	38	63/66	53	47	55	54	48	1	0	NA	1	R	T	-	-	-	-	
114719	Foxland Close, Birmingham	48	39	62/65	53	47	55	54	48	1	0	NA	65	R	T	-	-	-	-	
114723	Lycroft Avenue, Birmingham	50	41	66/69	53	47	55	55	48	1	1	A	24	R	T	-	-	-	-	
114727	Yorkminster Drive, Birmingham	52	43	67/71	65	60	74	65	60	0	0	A	8	R	T	H	-	-	-	
114737	Lycroft Avenue, Birmingham	51	42	66/70	53	47	55	55	48	2	1	A	45	R	T	-	-	-	-	
114952	Clover Avenue, Birmingham	48	39	63/66	53	47	55	54	48	1	0	NA	40	R	T	-	-	-	-	
115205	Friars Walk, Birmingham	48	39	64/67	53	47	55	54	48	1	0	NA	28	R	T	-	-	-	-	

Assessment Location		Impact criteria										Significance criteria								Significant effect
ID	Area represented	Proposed Scheme only (Year 15 traffic)			Do nothing (Opening year baseline)			Do something (Opening year baseline + Year 15 traffic) ****		Change		Type of effect	Number of impacts represented	Type of receptor	Receptor design	Existing environment	Unique feature	Combined impact	Mitigation of effect	
		Day *	Night **	Max ***	Day *	Night **	Max ***	Day *	Night **	Day *	Night **									
115343	Friars Walk, Birmingham	50	41	67/69	53	47	55	55	48	1	1	A	29	R	T	-	-	-	-	
115349	Lycroft Avenue, Birmingham	51	42	69/71	56	47	55	57	48	1	1	A	52	R	T	-	-	-	-	
115364	Clover Avenue, Birmingham	51	42	71/74	57	48	56	57	49	1	0	A	15	R	T	-	-	-	-	
115413	Bluebell Drive, Birmingham	49	41	69/72	57	48	56	57	48	0	0	A	25	R	T	-	-	-	-	
115486	Dunster Road, Birmingham	49	41	68/71	61	55	72	61	55	0	0	A	116	R	T	H	-	-	-	
115567	Lumley Grove, Birmingham	44	35	60/63	51	37	48	52	38	0	1	NA	84	R	T	-	-	-	-	
115571	Craig Croft, Birmingham	43	34	57/60	51	37	48	52	39	0	1	NA	34	R	T	-	-	-	-	
115743	Mulliners Close, Birmingham	45	36	59/62	61	55	72	61	55	0	0	NA	37	R	T	H	-	-	-	
116024	Marlene Croft, Birmingham	42	33	62/65	65	51	70	65	51	0	0	NA	204	R	T	H	-	-	-	
116976	Wardour Drive, Birmingham	40	32	54/57	54	40	53	54	40	0	0	NA	60	R	T	-	-	-	-	
117340	Wardour Drive, Birmingham	43	35	59/62	54	40	53	54	40	0	0	NA	69	R	T	-	-	-	-	
117503	Carisbrooke Avenue, Birmingham	44	36	61/63	49	37	48	49	37	0	0	NA	56	R	T	-	-	-	-	
117660	Chelmsley Road, Birmingham	43	34	58/61	51	37	48	52	38	0	1	NA	49	R	T	-	-	-	-	
117759	Dunster Road, Birmingham	45	36	61/64	59	48	61	59	48	0	0	NA	81	R	T	-	-	-	-	
117787	Fillingham Close, Birmingham	47	38	67/70	55	51	60	56	51	0	0	NA	32	R	T	-	-	-	-	
117835	Dunster Road, Birmingham	49	40	68/71	66	55	72	66	55	0	0	A	13	R	T	H	-	-	-	
117857	Fillingham Close, Birmingham	49	41	69/71	66	55	72	66	55	0	0	A	16	R	T	H	-	-	-	
118017	Dunster Road, Birmingham	44	36	61/63	59	48	61	59	48	0	0	NA	49	R	T	-	-	-	-	
118170	Fillingham Close, Birmingham	49	40	68/70	55	51	60	56	51	1	0	A	22	R	T	-	-	-	-	
118204	Coleshill Heath Road, Birmingham	50	42	68/71	66	55	72	66	55	0	0	A	13	R	T	H	-	-	-	

Assessment Location		Impact criteria										Significance criteria								Significant effect
ID	Area represented	Proposed Scheme only (Year 15 traffic)			Do nothing (Opening year baseline)			Do something (Opening year baseline + Year 15 traffic) ****		Change		Type of effect	Number of impacts represented	Type of receptor	Receptor design	Existing environment	Unique feature	Combined impact	Mitigation of effect	
		Day *	Night **	Max ***	Day *	Night **	Max ***	Day *	Night **	Day *	Night **									
118274	Marlene Croft, Birmingham	43	34	57/60	65	51	70	65	51	0	0	NA	64	R	T	H	-	-	-	
118460	Fillingham Close, Birmingham	46	37	60/63	53	46	60	54	46	0	0	NA	67	R	T	-	-	-	-	
118502	Coleshill Heath Road, Birmingham	48	39	67/69	62	52	71	62	52	0	0	NA	25	R	T	-	-	-	-	
118734	Chelmsley Road, Birmingham	46	38	64/66	53	46	60	54	46	0	0	NA	79	R	T	-	-	-	-	
118824	Coleshill Heath Road, Birmingham	46	38	65/68	62	52	71	62	52	0	0	NA	16	R	T	-	-	-	-	
119054	Coleshill Heath Road, Birmingham	47	38	63/66	62	52	71	62	52	0	0	NA	58	R	T	-	-	-	-	
119757	Marlene Croft, Birmingham	41	33	56/59	49	37	48	49	38	0	0	NA	1	R	T	-	-	-	-	
119785	Marlene Croft, Birmingham	42	34	57/59	65	51	70	65	51	0	0	NA	34	R	T	H	-	-	-	
120095	Nevada Way, Birmingham	41	33	55/58	49	37	48	49	38	0	1	NA	92	R	T	-	-	-	-	
121398	Partridge Close, Birmingham	45	36	60/63	57	50	66	57	50	0	0	NA	28	R	T	-	-	-	-	
121445	Ryeclose Croft, Birmingham	48	39	68/71	57	50	66	57	50	0	0	NA	30	R	T	-	-	-	-	
121494	Ryeclose Croft, Birmingham	48	38	62/65	57	50	66	57	50	0	0	NA	30	R	T	-	-	-	-	
121657	Wheaten Close, Birmingham	50	40	64/67	60	58	65	61	58	0	0	A	24	R	T	H	-	-	-	
121670	Brook Farm Walk, Birmingham	48	39	66/65	53	47	55	55	48	1	1	NA	144	R	T	-	-	-	-	
121806	Waterson Croft, Birmingham	47	38	63/66	53	47	55	54	48	1	0	NA	65	R	T	-	-	-	-	
121982	Woodlands Way, Birmingham	47	38	62/65	53	47	55	54	48	1	0	NA	73	R	T	-	-	-	-	
122203	Travellers Way, Birmingham	50	41	66/68	53	47	55	55	48	1	1	A	55	R	T	-	-	-	-	
122274	Cornfield Croft, Birmingham	48	39	64/68	53	47	55	54	48	1	1	NA	32	R	T	-	-	-	-	
122335	Cornfield Croft, Birmingham	49	39	64/67	66	61	76	66	61	0	0	NA	22	R	T	H	-	-	-	

Assessment Location		Impact criteria										Significance criteria								Significant effect
ID	Area represented	Proposed Scheme only (Year 15 traffic)			Do nothing (Opening year baseline)			Do something (Opening year baseline + Year 15 traffic) ****		Change		Type of effect	Number of impacts represented	Type of receptor	Receptor design	Existing environment	Unique feature	Combined impact	Mitigation of effect	
		Day *	Night **	Max ***	Day *	Night **	Max ***	Day *	Night **	Day *	Night **									
122378	Cornfield Croft, Birmingham	52	43	67/70	66	61	76	66	61	0	0	A	118	R	T	H	-	-	-	
122410	Yorkminster Drive, Birmingham	52	42	66/70	66	60	74	66	60	0	0	A	14	R	T	H	-	-	-	
122568	Yorkminster Drive, Birmingham	50	41	66/69	66	61	76	66	61	0	0	A	25	R	T	H	-	-	-	
122968	Roach Close, Birmingham	42	33	60/63	54	40	53	54	40	0	1	NA	152	R	T	-	-	-	-	
123085	Richmond Way, Birmingham	43	34	57/60	54	40	53	54	40	0	1	NA	64	R	T	-	-	-	-	
123146	Partridge Close, Birmingham	46	37	66/68	57	50	66	57	50	0	0	NA	56	R	T	-	-	-	-	
123214	Pike Drive, Birmingham	41	32	57/60	63	52	64	63	52	0	0	NA	33	R	T	-	-	-	-	
124272	Yorkminster Drive, Birmingham	53	44	67/71	65	59	75	65	59	0	0	A	8	R	T	H	-	-	-	
124293	Yorkminster Drive, Birmingham	53	44	67/71	65	59	75	65	59	0	0	A	8	R	T	H	-	-	-	
124314	Chiswick Walk, Birmingham	52	43	67/70	56	47	55	57	48	1	1	A	28	R	T	-	-	-	-	
124331	Chiswick Walk, Birmingham	53	43	70/73	56	47	55	57	48	1	1	A	25	R	T	-	-	-	-	
124367	Chiswick Walk, Birmingham	54	45	74/77	56	53	61	58	53	2	0	A	16	R	T	-	-	-	-	
124404	Yorkminster Drive, Birmingham	54	45	70/74	65	59	75	65	59	0	0	A	16	R	T	H	-	-	-	
124466	Chiswick Walk, Birmingham	52	43	70/73	56	47	55	57	48	1	1	A	5	R	T	-	-	-	-	
124483	Bluebell Drive, Birmingham	53	44	73/76	57	48	56	58	49	1	1	A	15	R	T	-	-	-	-	
124506	Bluebell Drive, Birmingham	52	43	72/75	57	48	56	57	49	1	0	A	14	R	T	-	-	-	-	
181301	Middle Bickenhill Lane, Hampton-In-Arden	60	54	73/76	57	53	62	60	55	3	1	S	2	R	T	-	-	-	-	~

Assessment Location		Impact criteria										Significance criteria								Significant effect
ID	Area represented	Proposed Scheme only (Year 15 traffic)			Do nothing (Opening year baseline)			Do something (Opening year baseline + Year 15 traffic) ****		Change		Type of effect	Number of impacts represented	Type of receptor	Receptor design	Existing environment	Unique feature	Combined impact	Mitigation of effect	
		Day *	Night **	Max ***	Day *	Night **	Max ***	Day *	Night **	Day *	Night **									
181323	Middle Bickenhill Lane, Hampton-In-Arden	65	57	68/71	65	62	67	65	62	0	0	A	2	R	T	H	-	-	-	
181420	Middle Bickenhill Lane, Hampton-In-Arden	61	52	77/79	59	55	61	63	56	3	1	A	2	R	T	H	-	-	-	~
181503	Chester Road, Coleshill	71	62	87/90	61	56	64	71	62	10	7	S	1	R	T	H	-	-	NI	OSV24-Do1
181557	Chester Road, Meriden	53	46	66/69	46	40	46	53	46	8	6	A	1	R	T	-	-	-	-	~
182291	Packington Lane, Meriden	54	46	64/66	56	52	57	56	53	1	0	A	5	R	T	-	-	-	-	
700557	Packington Park, Meriden	59	51	55/58	60	55	62	59	55	-1	0	A	2	R	T	H	-	-	-	
700563	Craig Croft, Birmingham	44	35	59/62	51	37	48	52	38	0	1	NA	2	R	T	-	-	-	-	
701081	Craig Croft, Birmingham	44	35	61/64	51	37	48	52	39	1	1	NA	1	R	T	-	-	-	-	
98009	National Exhibition Centre, (General Commercial)	51	43	57/60	56	51	54	56	51	1	0	A	1	G5	T	-	-	-	-	
99133	National Exhibition Centre, (General Commercial)	53	46	62/65	53	52	67	54	52	1	0	B	1	G5	T	-	-	-	-	
99690	Fire Station, National Exhibition Centre (Fire Station)	50	43	59/61	56	52	67	56	52	1	0	B	1	G4	T	-	-	-	-	
100515	Coventry Road, Bickenhill (Museum)	60	56	58/62	59	55	58	60	56	1	1	B	1	G3	T	-	-	-	-	
100628	Premier Inn, Bickenhill Parkway (Inn)	52	44	64/67	55	51	54	56	51	1	0	B	1	G5	T	-	-	-	-	
100835	Solihull Parkway, Birmingham Business Park (Police Services)	55	46	70/73	63	49	55	64	50	0	1	B	10	G4	T	-	-	-	-	
100835	Waterside Centre, Solihull Parkway (General	55	46	70/73	63	49	55	64	50	0	1	B	8	G5	T	-	-	-	-	

Assessment Location		Impact criteria										Significance criteria								Significant effect
ID	Area represented	Proposed Scheme only (Year 15 traffic)			Do nothing (Opening year baseline)			Do something (Opening year baseline + Year 15 traffic) ****		Change		Type of effect	Number of impacts represented	Type of receptor	Receptor design	Existing environment	Unique feature	Combined impact	Mitigation of effect	
		Day *	Night **	Max ***	Day *	Night **	Max ***	Day *	Night **	Day *	Night **									
	Commercial)																			
100835	Parkside, Birmingham Business Park (Local Government Office)	55	46	70/73	63	49	55	64	50	0	1	B	3	G5	T	-	-	-	-	
100835	Parkside, Birmingham Business Park (General Commercial)	55	46	70/73	63	49	55	64	50	0	1	B	1	G5	T	-	-	-	-	
100835	Parkside, Birmingham Business Park (General Commercial)	55	46	70/73	63	49	55	64	50	0	1	B	6	G5	T	-	-	-	-	
100835	Parkside, Birmingham Business Park, (General Commercial)	55	46	70/73	63	49	55	64	50	0	1	B	2	G5	T	-	-	-	-	
100835	Solihull Parkway, Birmingham Business Park, (General Commercial)	55	46	70/73	63	49	55	64	50	0	1	B	1	G5	T	-	-	-	-	
101235	Solihull Parkway, Birmingham Business Park	58	50	71/74	63	49	55	64	52	1	3	A	2	G5	T	-	-	-	-	\$
101954	Knights Court, Birmingham Business Park (Further Education College)	67	57	82/85	62	49	55	67	57	5	8	B	1	G4	T	-	-	-	-	^
101954	Knights Court, Birmingham Business Park (Office)	67	57	82/85	62	49	55	67	57	5	8	B	15	G5	T	-	-	-	-	OSV24-No1
112149	Tulip Walk, Birmingham, (Shopping)	45	37	59/62	53	46	60	54	46	0	0	B	1	G5	T	-	-	-	-	
114604	Windy Arbor Junior & Infant	47	38	63/66	53	47	55	54	48	1	0	B	1	G4	T	-	-	-	-	

Assessment Location		Impact criteria										Significance criteria								Significant effect
ID	Area represented	Proposed Scheme only (Year 15 traffic)			Do nothing (Opening year baseline)			Do something (Opening year baseline + Year 15 traffic) ****		Change		Type of effect	Number of impacts represented	Type of receptor	Receptor design	Existing environment	Unique feature	Combined impact	Mitigation of effect	
		Day *	Night **	Max ***	Day *	Night **	Max ***	Day *	Night **	Day *	Night **									
	School (Infant School)																			
115571	Seventh Day Adventists Church (church)	43	34	57/60	51	37	48	52	39	0	1	B	1	G3	T	-	-	-	-	
115571	Craig Croft Child Health Clinic, Craig Croft (Clinic)	43	34	57/60	51	37	48	52	39	0	1	B	3	G4	T	-	-	-	-	
115571	Hedingham Grove, (General Commercial)	43	34	57/60	51	37	48	52	39	0	1	B	1	G5	T	-	-	-	-	
115819	Dunster Road, Birmingham, (Shopping)	45	37	61/64	61	55	72	61	55	0	0	B	1	G5	T	-	-	-	-	
115819	Croft Industrial Estate, Dunster Road (General Commercial)	45	37	61/64	61	55	72	61	55	0	0	B	4	G5	T	-	-	-	-	
118460	Longley Walk, Birmingham, (Shopping)	46	37	60/63	53	46	60	54	46	0	0	B	1	G5	T	-	-	-	-	
118734	Helmswood Drive, Birmingham (General Commercial)	46	38	64/66	53	46	60	54	46	0	0	B	1	G5	T	-	-	-	-	
121670	Brook Farm Walk, Birmingham (Shopping)	48	39	66/65	53	47	55	55	48	1	1	B	1	G5	T	-	-	-	-	
122203	Beechwood Nursery, Windy Arbor Primary School, (Nursery)	50	41	66/68	53	47	55	55	48	1	1	B	1	G4	T	-	-	-	-	
122203	Windy Arbor Primary School, Woodlands Way, (School)	50	41	66/68	53	47	55	55	48	1	1	B	1	G4	T	-	-	-	-	
122709	Griffin Business Park (General Commercial)	43	34	62/64	67	52	64	67	52	0	0	A	1	G5	T	H	-	-	-	

Assessment Location		Impact criteria										Significance criteria								Significant effect
ID	Area represented	Proposed Scheme only (Year 15 traffic)			Do nothing (Opening year baseline)			Do something (Opening year baseline + Year 15 traffic) ****		Change		Type of effect	Number of impacts represented	Type of receptor	Receptor design	Existing environment	Unique feature	Combined impact	Mitigation of effect	
		Day *	Night **	Max ***	Day *	Night **	Max ***	Day *	Night **	Day *	Night **									
123214	Scout Hall, Pike Drive, Chelmsley Wood, (Hall)	41	32	57/60	63	52	64	63	52	0	0	B	1	G3	T	-	-	-	-	
123622	Solihull Parkway, Birmingham Business Park (General Commercial)	58	49	76/79	62	49	55	63	51	1	2	B	1	G5	T	-	-	-	-	
123622	The Crescent, Birmingham Business Park (Office)	58	49	76/79	62	49	55	63	51	1	2	B	16	G5	T	-	-	-	-	
123706	Solihull Parkway, Birmingham Business Park (General Commercial)	55	46	70/72	63	49	55	64	50	0	1	B	4	G5	T	-	-	-	-	
123773	Park Square, Solihull Parkway, Birmingham Business Park (General Commercial)	50	41	66/69	53	49	55	54	49	2	0	B	5	G5	T	-	-	-	-	
123773	The Pavilions, The Crescent, Birmingham Business Park (General Commercial)	50	41	66/69	53	49	55	54	49	2	0	B	1	G5	T	-	-	-	-	
123773	The Crescent, Birmingham Business Park (General Commercial)	50	41	66/69	53	49	55	54	49	2	0	B	2	G5	T	-	-	-	-	
123856	Regent Court, The Crescent, Birmingham Business Park, (General Commercial)	55	46	73/75	62	49	55	63	50	0	1	B	4	G5	T	-	-	-	-	
123856	The Crescent, Birmingham Business Park (General Commercial)	55	46	73/75	62	49	55	63	50	0	1	B	2	G5	T	-	-	-	-	
123856	The Crescent, Birmingham	55	46	73/75	62	49	55	63	50	0	1	B	1	G5	T	-	-	-	-	

Assessment Location		Impact criteria										Significance criteria								Significant effect
ID	Area represented	Proposed Scheme only (Year 15 traffic)			Do nothing (Opening year baseline)			Do something (Opening year baseline + Year 15 traffic) ****		Change		Type of effect	Number of impacts represented	Type of receptor	Receptor design	Existing environment	Unique feature	Combined impact	Mitigation of effect	
		Day *	Night **	Max ***	Day *	Night **	Max ***	Day *	Night **	Day *	Night **									
	Business Park (Shopping)																			
123995	Birmingham Business Park (General Commercial)	67	58	81/84	62	52	62	67	58	5	5	B	1	G5	T	-	-	-	-	^
124567	The Crescent, Birmingham Business Park (General Commercial)	52	43	68/70	62	49	55	63	49	0	0	B	2	G5	T	-	-	-	-	
124567	Kings Court, The Crescent, Birmingham Business Park, (Office)	52	43	68/70	62	49	55	63	49	0	0	B	7	G5	T	-	-	-	-	
129971	Holiday Inn Express, Bickenhill Parkway, Birmingham, (Hotel)	64	56	75/78	61	52	62	65	56	4	4	B	1	G4	T	-	-	-	-	OSV24-No2
129971	Bickenhill Parkway, Birmingham (General Commercial)	64	56	75/78	61	52	62	65	56	4	4	B	1	G5	T	-	-	-	-	^
129994	Bishops Court, Birmingham Business Park (Office)	63	53	80/83	62	49	55	65	54	3	5	B	13	G5	T	-	-	-	-	OSV24-No1
176071	Chester Road, Coleshill (General Commercial)	62	55	76/79	61	56	64	64	58	4	2	B	1	G5	T	H	-	-	-	^
182204	Coventry Road, Meriden, (Restaurant)	64	56	62/65	73	65	67	73	65	0	0	B	1	G5	T	H	-	-	-	
183646	Quartz Point, Stonebridge Road, Coleshill (Office)	64	55	77/80	65	56	64	67	58	2	2	B	12	G5	T	H	-	-	-	
700557	Mill Farm Barns, Packington Park, Meriden (General Commercial)	59	51	55/58	60	55	62	59	55	-1	0	B	5	G5	T	-	-	-	-	

Assessment Location		Impact criteria										Significance criteria								Significant effect
ID	Area represented	Proposed Scheme only (Year 15 traffic)			Do nothing (Opening year baseline)			Do something (Opening year baseline + Year 15 traffic) ****		Change		Type of effect	Number of impacts represented	Type of receptor	Receptor design	Existing environment	Unique feature	Combined impact	Mitigation of effect	
		Day *	Night **	Max ***	Day *	Night **	Max ***	Day *	Night **	Day *	Night **									
701081	Craig Croft, Birmingham, (General Commercial)	44	35	61/64	51	37	48	52	39	1	1	B	1	G5	T	-	-	-	-	
701081	Dunster Road Post Office, Craig Croft (Post Office)	44	35	61/64	51	37	48	52	39	1	1	B	1	G5	T	-	-	-	-	
701081	Craig Croft, Birmingham, (Restaurant)	44	35	61/64	51	37	48	52	39	1	1	B	1	G5	T	-	-	-	-	

### Direct impact - Summary

4.3.7 The operational airborne noise impacts identified in Table 3 are summarised in Table 4.

Table 4: Summary of operational airborne sound impacts

Receptor	Number of impacts		
	Minor	Moderate	Major
Residential properties	4	1	1
Non-residential properties	3	30	0
Quiet areas	None	None	None

## 4.4 Assessment of impacts and effects

### Residential receptors: direct effects - individual buildings

- 4.4.1 Taking account of the avoidance and mitigation measures incorporated into the Proposed Scheme, the assessment has identified one residential building close to the Proposed Scheme – Common Farm on the A452 Chester Road, Coleshill - where noise would exceed the daytime trigger threshold set in the Regulations, represented by receptor reference 181503 (marked as OSV24-Do1 in Table 3). It is therefore estimated that this building is likely to qualify for noise insulation under the Regulations. The building is indicated on Map SV-02, Volume 5, Map Book Sound, noise and vibration.
- 4.4.2 The mitigation measures including noise insulation will reduce noise inside all dwellings such that it will not reach a level where it would significantly affect residents.

### Residential receptors: direct effects –communities

- 4.4.3 The avoidance and mitigation measures in this area will avoid significant airborne noise effects on the majority of receptors, and at the following communities:
- Coleshill; and
  - Chelmsley Wood.
- 4.4.4 Taking account of the envisaged mitigation, Map SV-02, Volume 5 CFA24 Map Book shows the long term 40dB<sup>2</sup> night-time sound level contour from the operation of trains on the Proposed Scheme. The extent of the 40dB night-time sound level contour is equivalent to, or slightly larger than, the 50dB daytime contour<sup>3</sup>. In general, below these levels adverse effects are not expected.

<sup>2</sup> Defined as the equivalent continuous sound level from 23:00 to 07:00 or  $L_{pAeq,night}$

<sup>3</sup> With the train flows described in the assumptions section of this CFA Report, the daytime sound level (defined as the equivalent continuous sound level from 07:00 to 23:00 or  $L_{pAeq,day}$ ) from the Proposed Scheme would be approximately 10dB higher than the night-time sound level. The 40dB contour therefore indicates the distance from the Proposed Scheme at which the daytime sound level would be 50dB.

- 4.4.5 Above 40dB during the night and 50dB during the day the effect of noise is dependent on the baseline sound levels in that area and the change in sound level (magnitude of effect) brought about by the Proposed Scheme. The airborne noise impacts and effects forecast for the operation of the scheme are presented on Map SV-02, Volume 5, CFA24 Map Book).
- 4.4.6 The changes in noise levels are likely to affect the acoustic character of the area such that there is a perceived change in the quality of life and are considered to be significant when assessed on a community basis taking account of the local context.
- 4.4.7 However as a result of the avoidance and mitigation measures included within the Proposed Scheme, the assessment has not identified any adverse effects that are considered to be significant on a community basis.
- 4.4.8 In Coleshill one residential property is subject to ground-borne vibration impact as a result of the Proposed Scheme. Given the low magnitude of the impact and the number of buildings affected, the effect is not considered to be significant.
- 4.4.9 Three isolated properties within the area have been identified as being subject to an observed adverse noise effect; these effects are likely to be considered as an effect on the acoustic character of the area such that there is a perceived change in the quality of life. However, as the affected properties are spatially remote from larger defined residential areas, are subject to smaller magnitudes of noise effect, or are small in number, the effects are not considered to be significant.

### **Residential receptors: indirect effects**

- 4.4.10 The transport assessment presented in Volume 5: Appendix TR-001-000, has been used to identify those roads or railways within this study area where the alignment remains as at present, but a change in flow or composition is identified which is greater than the screening criteria defined in Volume 5: Appendix SV-001-000. No roads or railways which exceed the criteria defined in Volume 5: Appendix SV-001-000 have been identified in this study area.
- 4.4.11 The assessment of operational noise and vibration indicates that significant indirect effects on residential receptors are unlikely to occur in this area.

### **Non-residential receptors: direct effects**

- 4.4.12 The assessment has identified airborne noise impacts at offices at Knights Court, Bishops Court other offices in Birmingham Business Park, Holiday Inn Express and other offices on Bickenhill Parkway and a Garden Centre on Chester Road, Coleshill, represented by receptor references 101954, 129994, 132995, 129971 and 176071.

### *Knights Court, Solihull Parkway*

- 4.4.13 A moderate operational noise impact has been identified based upon the change in the airborne noise level outside this receptor, reference 101954. An assessment has been undertaken to determine if this impact would result in a likely significant effect at this non-residential receptor, using the significance criteria detailed in Volume 5: Appendix 001-000.
- 4.4.14 The Knight's Court, which is part of Birmingham Business Park, consist of nine, two storey purpose built offices constructed from brick walls, metal profile roofs and double glazed windows together with two, two storey purpose built offices constructed from brick walls, tiled roofs and double glazed windows. It is assumed that ventilation is provided to all of the blocks by opening the windows. The occupancy is primarily for offices although there is a further education establishment located within Block 6140. Block 6140 is located approximately 100m further from the Proposed Scheme than the receptor location and the outside levels as a result of the Proposed Scheme are likely to be below the screening values.
- 4.4.15 The closest office blocks to the Proposed Scheme are identified, on a precautionary basis, as being subject to a significant adverse effect denoted by OSV24-No1 in Table 3 and drawing SV-02 (see CFA24 Volume 5 sound, noise and vibration map book). This may take the form of the activity disturbance to the people using the offices.

### *Solihull Parkway, Birmingham Business Park*

- 4.4.16 A moderate operational noise impact has been identified based upon the change in the airborne noise level outside this receptor, reference 123995. An assessment has been undertaken to determine if this impact would result in a likely significant effect at this non-residential receptor, using the significance criteria detailed in Volume 5: Appendix 001-000.
- 4.4.17 The receptor is currently occupied by Fujitsu Telecommunications Europe Limited, the building constructed of steel frame, double glazed curtain wall cladding with a composite roof. It is assumed that ventilation is provided by air conditioning.
- 4.4.18 The sound insulation that would be provided by this building shell and ventilation arrangement is likely to be substantially greater than the assumption of open windows that forms the basis if the relevant screening criterion defined for this category of building in Volume 5: Appendix SV-001-000. The incident sound levels forecast in Table 3 outside this receptor are therefore unlikely to give rise to a significant observed adverse effect inside this receptor.

### *Holiday Inn Express, Bickenhall Parkway*

- 4.4.19 A minor operational noise impact has been identified based upon the change in the airborne noise level outside this receptor, reference 129971. An assessment has been undertaken to determine if this impact would result in a likely significant effect at this non-residential receptor, using the significance criteria detailed in Volume 5: Appendix 001-000.

- 4.4.20 The Holiday Inn Express hotel consists of a three storey purpose built hotel constructed from brick walls and double glazed windows. It is assumed that ventilation is provided by opening the windows.
- 4.4.21 The Holiday Inn Express hotel is identified, on a precautionary basis, as being subject to a significant adverse effect denoted by OSV24-No2 in Table 3 and drawing SV-02 (see CFA24 Volume 5 sound, noise and vibration map book). This may take the form of the activity disturbance and sleep disturbance to the people using the hotel.

### *Bickenhill Parkway, Birmingham*

- 4.4.22 A minor operational noise impact has been identified based upon the change in the airborne noise level outside this receptor, reference 129971. An assessment has been undertaken to determine if this impact would result in a likely significant effect at this non-residential receptor, using the significance criteria detailed in Volume 5: Appendix 001-000.
- 4.4.23 The office building to the west of the Holiday Inn Express hotel currently occupied by Little Owl, consists of a two storey building constructed from brick walls, tiled and felt roof and single / double glazed windows. It is assumed that ventilation is provided by opening the windows.
- 4.4.24 The prediction is made at the upper floor of the Holiday Inn Express hotel, which is taller and 120m closer to the Proposed Scheme and therefore the sound level at this receptor will be lower than presented. Allowing for this, the incident sound levels within the building are not likely to result in activity disturbance within the building and therefore, the impact at this non-residential receptor will not result in a significant observed adverse noise effect at this receptor.

### *Bishops Court, Solihull Parkway, Birmingham Business Park*

- 4.4.25 A minor operational noise impact has been identified based upon the change in the airborne noise level outside this receptor, reference 129994. An assessment has been undertaken to determine if this impact would result in a likely significant effect at this non-residential receptor, using the significance criteria detailed in Volume 5: Appendix 001-000.
- 4.4.26 The Bishop's Court consist of five, two storey purpose built offices constructed from brick walls with tiled roofs and double glazed windows. Bishop's Court is part of the Birmingham Business Park. It is assumed that ventilation is provided to all of the blocks by opening the windows.
- 4.4.27 The closest office blocks to the Proposed Scheme are identified, on a precautionary basis, as being subject to a significant adverse effect denoted by OSV24-No1 in Table 3 and drawing SV-02 (see CFA24 Volume 5 sound, noise and vibration map book). This may take the form of the activity disturbance to the people using the offices.

### *Chester Road, Coleshill*

- 4.4.28 A minor operational noise impact has been identified based upon the change in the airborne noise level outside at this receptor, reference 176071. An assessment has been undertaken to determine if this impact would result in a likely significant effect at this non-residential receptor, using the significance criteria detailed in Volume 5: Appendix 001-000.
- 4.4.29 The receptor is currently occupied by Melbick Garden Centre, the building is constructed of a steel frame, glazed cladding with a composite roof. Much of the function of the building is currently undertaken outside and is in close proximity to the A452, and is not considered to be sensitive to noise. Therefore, the incident sound levels from the Proposed Scheme within the building are not likely to result in activity disturbance and therefore, the impact at this non-residential receptor will not result in a significant observed adverse noise effect.

### *Summary*

- 4.4.30 The assessment of operational noise and vibration indicates that significant effects are likely on the non-residential receptors identified in Table 5.
- 4.4.31 The assessment of effects on non-residential receptors has been undertaken on a reasonable worst case basis taking account of public available information about each receptor.

Table 5: Likely significant noise or vibration effects on non-residential receptors arising from operation of the Proposed Scheme

Significant effect number (see Map series SV-02, Table 1 and 3)	Type of significant effect and source	Time of day	Location and details
OSV24-No1	Potential noise disturbance of office activities <sup>4</sup> inside two office buildings due to the operation of train services.	Daytime	Two office buildings at Birmingham Business Park located closest to the route
OSV24-No2	Potential disturbance of hotel activities <sup>32</sup> due to the operation of train services	Daytime and night-time	Holiday Inn Express Birmingham NEC

### **Non-residential receptors: indirect effects**

- 4.4.32 The transport assessment presented in Volume 5: Appendix TR-001-000, has been used to identify those roads or railways within this study area where the alignment remains as at present, but a change in flow or composition is identified which is greater than the screening criteria defined in Volume 5: Appendix SV-001-000. No roads or railways which exceed the criteria defined in Volume 5: Appendix SV-001-000 have been identified in this study area.

<sup>4</sup> Potential for activity disturbance, especially for activities that require good conditions for verbal communication

- 4.4.33 The assessment of operational noise and vibration indicates that significant indirect effects are unlikely to occur on non-residential receptors in this area.

### Cumulative effects

- 4.4.34 Details of properties being currently developed which were afforded planning approval before the safeguarding date are presented in Volume 5: Appendix CToo4-000. Within this area, the operational sound, noise or vibration associated with these developments in conjunction with the operation of the Proposed Scheme do not result in any significant cumulative effects.